Please staple this **coversheet** to your work. **Name:**____________________, _______

Last First

1.	2.	3.	4.	5.	6.	7.	**Sum:**

Physics 311 **Homework Set 3** **Due: Sept. 14, 2009**

J. van Howe

1. Griffiths 2.10

2. Gauss's Law for non-uniform charge density:

(a) Find the electric field both inside and outside of a sphere of radius R which contains a charge density of $\rho(r') = kr'^2$, where k is just a constant.

(b) Sketch the magnitude of the electric field as a function of the distance r from the center of the sphere.

3. Griffiths 2.13

4. Griffiths 2.16

5. Consider the case of concentric spherical conducting shells, inner conductor $r = a$, and outer shell $r = b$, where $a < b$.

(a) First find expressions for $\vec{\boldsymbol{E}}(r)$ and $V(r)$ everywhere. To do so, assume that the inner shell has a net charge of q_a and that the outer shell has a net charge of q_b

(b) How do these expressions change if $q_b = -q_o$ on the outer conductor, and the inner conductor is grounded? Grounding shell *a* means that $V(a) = V(\infty) = 0$. Note that this problem is very similar to Griffiths 2.35.

6. Griffiths 2.21

7. Griffiths 2.25; your answers to check are the following:

(a) $\vec{\boldsymbol{E}} = \frac{1}{4\pi\varepsilon_o}\frac{2qz}{\left(z^2+(d/2)^2\right)^{3/2}}\hat{\boldsymbol{z}}$, (b) $\vec{\boldsymbol{E}} = \frac{1}{4\pi\varepsilon_o}\frac{2L\lambda}{z\sqrt{z^2+L^2}}\hat{\boldsymbol{z}}$, (c) $\vec{\boldsymbol{E}} = \frac{\sigma}{2\varepsilon_o}\left(1-\frac{z}{\sqrt{R^2+z^2}}\right)\hat{\boldsymbol{z}}$

(Note now that you know these, this could be a good opportunity go back and do these problems for practice! At least note how you would set them up. Is using potential easier?)